DOCUMENT RESUME

ED 238 913 TM 840 003

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TITLE Anxiety and the Retrieval of Information from Long Term Memory.
PUB DATE [83]
NOTE 16p.; Paper presented at the Annual Meeting of the Northeastern Educational Research Association, (14th, Ellenville, NY, October 26-28, 1983).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Cognitive Processes; Higher Education; *Long Term Memory; Models; *Recall (Psychology); *Study Habits; *Test Anxiety
IDENTIFIERS *Interference (Learning); *Retrieval (Memory); Sarason Test Anxiety Scale

ABSTRACT

This study investigated whether test anxiety affected performance because: (1) examination stress interfered with retrieval of previously learned material, or (2) initial learning was less thorough. Results indicated significant negative correlations with acquisition indices and partially supported a retrieval deficit. Suggestions for further research are made. (Author)

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ED238913

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Abstract

This study investigated whether test anxiety affected performance because: 1) examination stress interfered with retrieval of previously learned material; or, 2) initial learning was less thorough. Results, n=84, indicated significant negative correlations with acquisition indices and partially supported a retrieval deficit. Suggestions for further research are made.

The debilitating effects of anxiety on academic performance have been frequently supported. This study was undertaken to define more clearly the relationship between anxiety and the mechanism for retrieving information from long term memory in an educational context.

Explanations for the reduced performance by anxious individuals include an interference model and a study skills

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deficit model. The interference model posits that anxiety produces task-irrelevant responses in the testing situation. These responses interfere with task-relevant responses and reduce the effectiveness with which prior learning is retrieved, hence, the negative relationship between anxiety and test performance (Wine, 1971; Sarason, 1972) . The study skills deficit model holds that highly anxious students frequently have poorer study skills than low anxious students and that the effect of these study skills is reduced initial learning, finally reflected in test results (Desiderato & Koskinen, 1969; Wittmaier, 1972) .

Sarason (1972) suggested that the debilitating effects of anxiety in testing situations were a function of anxiety's interference with cognitive processes, i.e., high levels of anxiety lead to task-irrelevant responses which inhibit task-relevant responses. Wine (1971, 1980) has identified direction of attention as a major factor in anxiety's effect on test scores. Wine contends that the attention of highly anxious individuals in an evaluative situation is divided between task-relevant (answering questions) and task-irrelevant responses (worrying). Those who experience high levels of anxiety give a significant portion of their attention to task-irrelevant responses. With only a small portion of their attention available for task-relevant responses, their test performance is depressed. Work by Morris and Liebert (1970) provides evidence that supports Wine's analysis. In examining the emotional and cognitive (worry) aspects of anxiety, Morris

and Liebert found a strong negative relationship between worry and academic performance.

Tobias (1977,1979) proposed a model for research directed towards identifying the effects of anxiety on learning at each of three information processing stages. He contends that anxiety's effect on learning must occur through its impacting on the cognitive processes that lead to learning. That is, anxiety may interfere with the pre-processing or input of information; the processing and storage of information; or the post-processing or retrieval of information from long term memory. This study attempts to clarify the post-processing effect of anxiety.

The study skills deficit model is based on research indicating that high anxious students have poorer study skills than low anxious students. For example, Desiderato and Koskinen (1969) found that, while high anxiety was associated with low grades, high anxious students had poorer study skills than low anxious students. In addition, the quality of study habits and amount of studying time were positively related to academic performance. They concluded that defective study skills accounted for poor academic performance--not anxiety. Lin and McKeachie (1970) also found differences between high and low anxious students in ability and study habits.

Wittmaier (1972) examined the effects of both debilitating and facilitating anxiety on academic performance. He found that students with low levels of debilitating anxiety have better

study habits than their high anxious counterparts and avoid delaying academic tasks. He concluded that pre-exam test anxiety is partially the cause of and partially the effect of ineffective study habits. Mitchell and Ng (1972) reached similar conclusions in their study. Mueller (1978) found differences in levels of organizing information for high and low anxious students. As a result, he states that deficits in free recall for high anxious students are a function of shallow encoding at acquisition.

Holroyd, Westbrook, Wolf, and Bodhorn (1978) and Culler and Holahan (1980) also questioned the interference model. These authors studied the role of intellectual ability and study habits for high and low anxious students. They concluded that high anxious students are right to be anxious because they have not learned the material well. While they agree that high anxiety precedes and is related to poor performance, they assert that this situation occurs because poor ability leads to high anxiety.

Benjamin, McKeachie, Lin, and Holinger (1981) used an information processing model to explain performance deficits of high test anxious students vis-a-vis problems in encoding, organization, and/or retrieval of information in a testing situation. While they found evidence of an encoding deficit for high anxious students, a retrieval deficit was supported as well.

In order to make statements about the effects of anxiety on

retrieving information, it would seem essential to determine how much a student has learned before debating the presence or absence of interference in the retrieval of that prior learning. This study has attempted to assess student learning at acquisition and then to determine whether the retrieval of previously mastered material was affected by test anxiety.

Method

Subjects

Students in four sections of an introductory educational psychology course at City College of New York served as subjects in this study. A total of 84 students, 64 females and 20 males were involved. The same instructor taught all sections.

Procedure

The Test Anxiety Scale (Sarason, 1972) was administered first. one week later, students began to view a total of six audiovisual modules that covered sections of the course material. Each module lasted approximately 35 minutes. The topics covered were: a. an introduction to individualized instruction; b. programmed instruction; c. an introduction to the uses of computers in education; d. computer assisted instruction; e. the theory of Kurt Lewin; and, f. transfer and its importance in education.

The students were informed that they were involved in evaluating proposed modules for a planned individualization of the course they were taking. They were also told that, while the pre- and post-tests on the modules were to determine the effectiveness of the modules, they would be tested later on the materials presented and that their grades on the modules would account for 25% of their grade in the course.

The modules were viewed at one week intervals during six separate two-hour class meetings. The procedure for each module was the same. A pre-test was given immediately preceding the module. The instructor told the students: "You are not expected to know the answers to all these questions. We would just like to find out how much information is actually being communicated by these tapes--that's why we would like to know if you're familiar with the material before you see the tape." The Worry-Emotionality Scale (Liebert & Morris, 1967) was then administered. Students were asked to answer the questions in terms of how they felt while they were taking the test. The module was then shown on either one or two television screens which all students could see. There was sufficient light in the rooms for note-taking if the students desired to do so. The post-test, which was identical to the pre-test was then given; after which the Worry-Emotionality Scale was administered once again. The answers to all of the questions on the test were then discussed in the class session.

One week after the sixth module had been completed, a

summative test was given. The questions on this test were identical to those on the pre- and post-tests. Immediately before taking the test, the students were told by the instructor: "This test is extremely important. In the past, we have found that students who do not grasp this material do poorly in this course." After completing the test, the Worry-Emotionality Scale was administered for the final time.

Results

A correlation matrix for all variables was calculated. Pre-test, post-test, delayed post-test scores, and three additional retrieval variables were examined in terms of their relationship to test anxiety scale scores. The first additional variable calculated was the number of questions answered incorrectly on the pre-test that had been answered correctly on the post-test, but incorrectly on the delayed post-test (minus-plus-minus). The second comparison (plus-plus-minus) was the number of questions answered correctly on both the pre-test and the post-test that had been answered incorrectly on the delayed post-test. The third comparison (minus-minus-plus) was the number of questions answered incorrectly on both the pre-test and post-test that had been answered correctly on the delayed post-test.

All correlations between the test anxiety scale scores and pre-test scores on the six modules were negative. Four of these

correlations were significant. (See Table 1.) Correlations between anxiety and post-test scores indicated that there were significant negative relationships between these variables for five of the six modules. (See Table 2.) Delayed post-test scores were also negatively correlated with anxiety for four of the modules. (See Table 3.)

A significant relationship was found between test anxiety and the retrieval variable plus-plus-minus. No such relationship was found between test anxiety and the minus-plus-minus retrieval variable. The positive correlation indicates that high anxious students answered more questions incorrectly than did low anxious students, even when they had answered the same question correctly twice before. Surprising results were found for the third retrieval variable, minus-minus-plus. There was a significant correlation between this variable and anxiety, suggesting that high anxious students answered significantly more questions correctly that they had answered incorrectly twice before than did low anxious students. (See Table 4.)

Discussion

In this study, the classical finding that anxiety interferes with meaningful learning from instruction has been replicated. In general, test anxiety was negatively related, in five of six correlations, to immediate post-test scores.

Furthermore, test anxiety was also negatively related to delayed post-test scores in four of six correlations.

The relationship between anxiety and retrieval, however, remains unclear. In the two relationships examining the correlation between anxiety and scores that had been positive immediately after acquisition and negative on the delayed post-test, only one was significant. It will be recalled that these were the principal measures of retrieval of previously learned material from long term memory. These results suggest that differences in performance between high anxious and low anxious students are more likely to be significant when the learned material is highly familiar; that is, items which were passed both on pre-test and immediate post-test and failed thereafter. The second retrieval score, minus-plus-minus, was composed of less familiar material, and perhaps was poorly retrieved because of its relative unfamiliarity.

A significant relationship was found betweeen anxiety and minus-minus-plus. At first glance, it would seem from this finding that high anxiety facilitated improvement in test score. It is possible that those students who were highly anxious studied more or took more notes after the initial post-test than low anxious students, leading to passing some items failed on both the pre- and immediate post-tests.

The variable results for the different retrieval indices may also be a function of reliability. The three retrieval scores are discrepancy scores, i.e., score changes from one

testing to another. It is well known, of course, that such data are less reliable than the original scores on which they were based (Thorndike, 1963). Measurement error may, therefore, have contributed to the variable findings for the three retrieval indices.

In this study, the immediate post-test results had been conceptualized as acquisition data retrieved from students' working memory. The delayed post-test, on the other hand, had been conceptualized as retrieval of previously acquired material from long term memory. The variability in the results suggests, however, that different processes may have been operating. Students received the immediate post-test shortly after the completion of a module. Some of the post-test items may have referred to material early in the module, and therefore, dealt with content that students had learned as much as 35 minutes earlier. Clearly, in terms of the processes involved, the score on the immediate post-test was not only reflective of retrieval from intermediate term memory. Some items were probably measures of retrieval from long term memory at two different points in time, i.e., at immediate and delayed post-testing.

These results suggest that the evaluation of the effect of anxiety on retrieval from long term memory requires clear cut acquisition data obtained before students have the opportunity to store the results of learning in long term memory. Possible alternatives for the procedures used in the present experiment would be to compare students' performance on adjunct questions

administered immediately after text paragraphs that they have mastered, and their performance on similar questions administered at the completion of the module or sometime thereafter.

Table 1. Pre-test Means, Standard Deviations, and Correlations with Test Anxiety

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Total
x	5.88	1.91	1.85	2.06	2.26	2.21	2.93
sd	1.67	1.20	1.35	1.49	1.00	0.96	0.78
n	70	65	64	69	61	62	78
r	-0.39*	-0.12	-0.32*	-0.28*	-0.07	-0.21*	-0.35*

Table 2. Post-test Means, Standard Deviations, and Correlations with Test Anxiety

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Total
x	7.97	6.22	5.92	4.33	5.41	5.58	5.95
sd	2.29	2.36	2.23	2.45	1.62	1.93	1.64
n	70	66	66	70	65	64	78
r	-0.37*	-0.36*	-0.28*	-0.38*	-0.07	-0.23*	-0.40*

Table 3. Delayed Post-test Means, Standard Deviations, and Correlations with Test Anxiety

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Total
x	9.32	6.92	5.10	6.20	6.44	6.09	6.68
sd	1.81	2.48	2.25	2.43	1.70	2.30	1.59
n	73	73	73	73	73	73	73
r	-0.25*	-0.24*	-0.04	-0.28*	-0.29*	-0.14	-0.28*

Table 4. Comparison Means, Standard Deviations, and Correlations with Test Anxiety

	Minus-Plus-Minus	Plus-Plus-Minus	Minus-Minus-Plus
x	4.30	0.98	9.37
sd	2.70	1.05	4.05
n	73	73	73
r	0.13	0.22*	0.33*

* $p < .05$

Footnote

1. This paper was presented at the Fourteenth Annual Convocation of the Northeastern Educational Research Association, October 26-28, 1983, in Ellenville, N.Y.

References

Benjamin, M., McKeachie, W., Lin, Y., & Holinger, D. Test anxiety: Deficits in information processing. Journal of Educational Psychology, 1981, 73, 816-824.

Culler, R.E., & Holahan, C. Test taking and academic performance: The effects of study-related behaviors. Journal of Educational Psychology, 1980, 72, 16-20.

Desiderato, O., & Koskinen, P. Anxiety, study habits, and academic achievement. Journal of Counseling Psychology, 1969, 16, 162-165.

Holroyd, K.A., Westbrook, T., Wolf, M., & Bodhorn, E. Performance, cognition, and physiological responding in test anxiety. Journal of Abnormal Psychology, 1978, 87, 442-451.

Lin, Y., & McKeachie, W. Aptitude, anxiety, study habits, and academic performance. Journal of Counseling Psychology, 1970, 17, 306-309.

Mitchell, K., & Ng, K. Effects of group counseling and behavior therapy on the academic achievement of test-anxious students. Journal of Counseling Psychology, 1972, 19, 491-497.

Morris, L.W., & Liebert, R.M. Relationship of cognitive and emotional components of test anxiety to physiological arousal and academic performance. Journal of Consulting and Clinical Psychology, 1970, 35, 332-337.

Mueller, J. The effects of individual differences in test anxiety and type of orienting task on level of organization in free recall. Journal of Research in Personality, 1978, 12, 100-116.

Sarason, I.G. Experimental approaches to test anxiety: Attention and the uses of information. In C.D. Spielberger (Ed.), Anxiety: Current trends in theory and research, (Vol. 2). New York: Academic Press, 1972.

Thorndike, R.L. The concept of overachievement. New York: Teacher's College Press of Columbia University, 1963.

Tobias, S. Anxiety research in educational psychology. Journal of Educational Psychology, 1979, 71, 573-582.

Tobias, S. A model for research on the effect of anxiety on instruction. In J.E. Sieber, H.F. O'Neil, Jr., & S. Tobias, Anxiety, learning, and instruction. Hillside, N.J.: Erlbaum, 1977.

Wine, J.D. Cognitive-attentional theory of test anxiety. In I.G. Sarason (Ed.), Test anxiety: Theory, research, applications. Hillsdale, N.J.: Erlbaum, 1980.

Wine, J. Test anxiety and direction of attention. Psychological Bulletin, 1971, 71, 92-104.

Wittmaier, B. Test anxiety and study habits. Journal of Educational Research, 1972, 352-354.